

JOINT ADVANCED DISTRIBUTED SIMULATION (JADS)



Joint Test and Evaluation Program

Authorized Manning:	35
Total JT&E Budget (TY\$):	\$29M
Charter Date:	1QFY95
Completion Date:	3QFY00

Lead Service

Air Force

JT&E DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Joint Advanced Distributed Simulation (JADS) Joint Test and Evaluation (JT&E) is investigating the utility of advanced distributed simulation (ADS) technologies for test and evaluation purposes. The investigation is being carried out for three types of tests; i.e., across three “slices” of test and evaluation. The *first* of these is system integration testing, which has focused on air-to-air missiles as examples of precision guided munitions. The *second* is end-to-end (detection to destruction) testing of Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C⁴ISR) capability using the Joint Surveillance Target Attack Radar System (JSTARS) as an example. The *third* involves the utility of ADS in electronic warfare testing using the ALQ-131 self-protection jammer as an example. All three slices under investigation by JADS support the development and test and evaluation of systems with the mission of *precision engagement*. In addition, end-to-end

engagement capability of C⁴ISR systems such as JSTARS support *dominant maneuver* and the jamming feature of electronic warfare systems supports *full-dimensional protection*.

BACKGROUND INFORMATION

The feasibility study for this JT&E was carried out in 1993 at a time of great interest by the department in the utility of ADS beyond its established role in training. At this time, policymakers had high expectations for ADS utilization; but at the implementation level skepticism was high. Against this background, JADS was chartered in 1994 to conduct an objective assessment of the value of ADS in support of T&E. The original charter included the systems integration test and end-to-end test. In 1996, the charter was expanded to include an electronic warfare test.

Work on the system integration test began in 1QFY96. The effort was divided into a: (1) linked simulator phase, capitalizing on high fidelity missile (AIM-9) and aircraft (F-14 and F-18) simulation facilities at Pt. Mugu and China Lake; and (2) live-fly phase capitalizing on the Guided Weapons Evaluation Facility at Eglin AFB, using instrumentation to interact with open air F-16s. The work on the system integration test was completed in October 1997.

Work on the end-to-end test began with development of a simulator for the JSTARS radar, completed in 1998. Laboratory testing of the simulator was completed in October 1998. Integration of ADS onto an operational E-8C was completed in early 1999. The final phase, in which a live E-8C will replace the laboratory version and where live targets at an open-air range were added to the synthetic targets, was completed earlier this year.

Work on electronic warfare began in early FY97, with open-air data collection activities completed in October 1998. Phase two, incorporating a Digital System Model of the ALQ-131 self-protection jammer in an ADS test environment, was completed in December 1998. Phase three, incorporating an ALQ-131 pod installed on an F-16 aircraft in an installed system test facility in the ADS test environment, was completed earlier this year.

TEST & EVALUATION ACTIVITY

The systems integration test and results reporting were completed in FY98. The end-to-end test and results reporting were completed in the first half of FY99. Electronic warfare testing is complete and the reports are in preparation.

TEST & EVALUATION ASSESSMENT

The results from the system integration test indicate a cost-effective role for ADS in the testing of selected precision guided munitions. The utility is system dependent, but for many systems there will be value added. The prospects for a more effective test program are quantified in the JADS technical reports.

JADS offers the prospect of accelerating system development by beginning detailed weapon system integration while the platform is still under development. This system integration can be

accomplished by using ADS to capitalize on the high fidelity simulations of existing precision guided munitions without duplicating supporting infrastructure.

The results from the end-to-end test similarly indicate a cost-effective role for ADS in testing C⁴ISR systems. This utility arises because: (1) C⁴ISR systems operate in a distributed environment; and (2) there is a reasonable match between the technical characteristics of ADS and the technical characteristics of command and control architectures.

The implications of the recently completed electronic warfare test are still being analyzed and debated. For electronic warfare testing, in analogy to the case for the System Integration Test, ADS can be used to capitalize on existing high fidelity simulations of either threat air defense systems or electronic warfare systems without duplicating supporting infrastructure. In addition, ADS often allows one to present electronic warfare systems with a richer and more reactive environment than might otherwise be possible. As the electronic warfare systems become more integrated and incorporate more closed loop interactions, complex scenarios with many sensors will have very tightly constrained latency requirements. This cannot be accomplished with serial visits to a set of high fidelity simulators. However, as scenarios become more complex, the latency (and other) requirements on ADS become more stringent and difficult to meet.

Overall, it appears that there is substantial utility in ADS to support research and development and test and evaluation. Preliminary work should begin on linking selected ranges and labs so that broader expertise in the use of distributed simulation is developed. Ultimately, the real time use of this distributed infrastructure should become routine in RDT&E.

JADS has a fairly aggressive outreach effort to program offices to identify possible operational/developmental test applications. DOT&E has been supporting these efforts.

CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED

- ADS has utility in the development and test programs of some systems.
- Advanced distributed simulation capabilities are still far from “plug-and-play.”
- Use of ADS requires experts on the systems under test and networking.
- To make ADS more routine, substantial investments at the ranges and labs would be necessary.

These investments are probably warranted because of the potential to:

1. Integrate ADS in the acceleration of certain weapons systems integration.
2. Test evolving C⁴ISR programs.
3. Optimize the use of high fidelity threat and jammer representations.

